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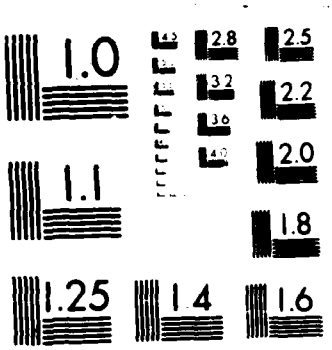

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The 80 to 130 km altitude region is our old "ignorosphere" - the region of the atmosphere that no one seems to be interested in, and yet the critical region for shuttle entry and atmospheric braking. Comparison between the Air Force reference atmosphere and Shuttle IMU data shows large fluctuations at high latitudes. New data sources are available new, such as the Arecibo and Millstone Hill ionospheric scatter radars.

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1987

MIDDLE ATMOSPHERE DENSITY AND MODELS

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MIDDLE ATMOSPHERE DENSITY AND MODELS

K. Champion, Air Force Geophysics Laboratory

The 80 to 130 km altitude region is our old "ignorosphere" - the region of the atmosphere that no one seems to be interested in, and yet the critical region for shuttle entry and atmospheric braking. Comparison between the Air Force reference atmosphere and Shuttle IMU data shows large fluctuations at high latitudes. New data sources are available now, such as the Arecibo and Millstone Hill ionospheric scatter radars.

Conclusions:

In the 20-80 km altitude range there is a reasonable quantity of data on the mean atmosphere; however, information on diurnal variability is needed.

In the 80-120 km altitude range data is needed to identify systematic variations and models for the region are preliminary. Unpredictable variations are observed: turbulence, storm effects, gravity waves.

SHUTTLE REENTRY DENSITY DATA

AF REFERENCE ATMOSPHERES 1978

DRAFT NEW REFERENCE MIDDLE ATMOSPHERE

A GLOBAL REFERENCE ATMOSPHERE FROM 18 TO 80KM

TIDAL EFFECTS

NEW MODELS FOR 80 TO 120KM

CONCLUSIONS

SHUTTLE LAUNCH AND LANDING DATES AND TIMES

FLIGHT	LAUNCH	LANDING
STS-1	APRIL 12, 1981 0700 EST	APRIL 14, 1981 1021 PST
STS-2	NOVEMBER 12, 1981 1010 EST	NOVEMBER 14, 1981 1323 PST
STS-4	JUNE 27, 1982 1000 EST	JULY 4, 1982 0809 PST
STS-5	NOVEMBER 11, 1982 0719 EST	NOVEMBER 16, 1982 0633 PST

A GLOBAL REFERENCE ATMOSPHERE FROM 18 TO 80KM

BASED ON NORTHERN AND SOUTHERN HEMISPHERE ROCKET DATA AND GLOBAL SATELLITE REMOTE SOUNDING DATA

CONTAINS DISTINCT NORTHERN AND SOUTHERN HEMISPHERE MODELS

ZONAL MEAN MODELS

TEMPERATURE	NUMBER DENSITY
PRESSURE	PRESSURE SCALE HEIGHT
DENSITY	GEOSTROPHIC (W-E) WIND

LONGITUDINAL MODELS

TEMPERATURE	DENSITY
PRESSURE	

NEW MODELS FOR 80 TO 120 KM ALTITUDES

BASED ON NORTHERN AND SOUTHERN HEMISPHERE ROCKET DATA AND ARECIBO AND MILLSTONE HILL INCOHERENT SCATTER TEMPERATURES

SINGLE HEMISPHERE MODELS
ZONAL MEAN MODELS

ANALYTIC TEMPERATURE FITS WITH LATITUDE AND ALTITUDE BUT NOT WITH TIME OF YEAR

TEMPERATURES AND PRESSURES FITTED AF REFERENCE ATMOSPHERES AT 68KM

CONCLUSIONS

SHUTTLE REENTRY DATA DEMONSTRATE PROBLEMS

CLIMATOLOGY OR PREDICTABLE VARIATIONS

20-80KM REASONABLE QUANTITY OF DATA
MODELS REASONABLY GOOD

NEED - DIURNAL VARIATIONS, CORRELATION DISTANCES AND TIMES, VARIABILITY

80-120KM REQUIRE ADEQUATE DATA TO IDENTIFY SYSTEMATIC VARIATIONS
MODELS ARE PRELIMINARY

NEED - MORE THEORETICAL AND EMPIRICAL MODELS
MORE DATA WITH GLOBAL AND TEMPORAL COVERAGE

UNPREDICTABLE VARIATIONS

TURBULENCE
STORM EFFECTS IN REAL TIME
LOCATION, AMPLITUDE, PHASE AND VELOCITY OF GRAVITY WAVES

END

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